*** ABSTRACT ONLY ***

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Fire Suppression Effectiveness Screening Methods for Halon 1301 Replacement Technologies

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The options being considered to replace halon 1301 include gases (e.g., HFC-125 or CO_2), liquids (e.g., fine water sprays) and powders (e.g., pyrotechnically generated aerosols). With inert gases and gaseous agents in the halocarbon family, existing test methods for determining the minimum concentration necessary to extinguish a fire by flooding a space are well established and have been demonstrated to predict full scale behavior with relative acumen. The behavior of condensed phase agents, and materials which are generated pyrotechnically, can not be predicted with any degree of certainty, and the development of these technologies has been hindered by its almost exclusive reliance on costly and difficult to control full-scale tests. This paper presents a methodology for categorizing the fire threat and alternative suppression strategies, and suggests ways to extract the key parameters controlling fire growth and the transport of the agent to the fire. By properly describing the environment, the fire, and the suppression process, a finite number of fire suppression scenarios can be defined.

The severity of the fire is dependent upon the surrounding geometry, the air flow, the type of fuel, and the resulting combustion wave (smoldering, non-premixed laminar flame, turbulent flame, or detonation). The effectiveness of the suppression process depends upon the chemical composition of the agent, whether it is a gas or condensed phase when equilibrated to atmospheric conditions, the physical release mechanism, and the pathway from the point of release to the seat of the fire. A new screening method being developed for evaluating solid propellant gas generator suppressants is used to demonstrate the application of this methodology.